

# Low Frequency Electrical Noise Across Contacts Between a Normal Conductor and Superconducting Bulk $\text{YBa}_2\text{Cu}_3\text{O}_7$

J. Hall and T.M. Chen

*Electrical Engineering Department, University of South Florida, Tampa, Florida  
33620*

Virtually every practical device that makes use of the new ceramic superconductors will need normal conductor to superconductor contacts. The current-voltage and electrical noise characteristics of these contacts could become important design considerations. This paper presents I-V and low frequency electrical noise measurements on contacts between a normal conductor and superconducting polycrystalline  $\text{YBa}_2\text{Cu}_3\text{O}_7$ . The contacts were formed by first sputtering gold palladium pads onto the surface of the bulk superconductor and then using silver epoxy to attach a wire(s) to each pad. For small current densities, voltage across the contacts was found to be proportional to  $I^{.71}$ . The voltage spectral density,  $S_V(f)$ , a quantity often used to characterize electrical noise, very closely followed an empirical relationship given by,

$$S_V(f) = \frac{C(VR)^2}{f},$$

where  $V$  is the DC voltage across the contact,  $R$  is the contact resistance,  $f$  is frequency, and  $C$  is a constant found to be  $2 \times 10^{-10}/\Omega^2$  at  $78^\circ \text{K}$ . This relationship was found to be independent of contact area, contact geometry, sample fabrication technique, and sample density.